

## Case Report

# Squamous Papilloma With Hyperpigmentation in the Skin Graft of the Neovagina in Rokitansky Syndrome: Literature Review of Benign and Malignant Lesions of the Neovagina

Muhammad T. Idrees, MD<sup>1</sup>, Liane Deligdisch, MD<sup>1</sup>, and Albert Altchek, MD<sup>2</sup>

<sup>1</sup>Department of Pathology; <sup>2</sup>Department of Obstetrics, Gynecology and Reproductive Science, Mount Sinai Medical Center, New York, New York, USA

**Abstract.** *Background:* It is rare for a benign or malignant neoplasm to develop in a neovagina.

*Case:* This is the first report of a squamous papilloma with hyperpigmentation which developed in the neovagina 12 years after a McIndoe procedure was done with a split-thickness skin graft from the patient's buttock. The patient had congenital absence of the vagina and uterus (Rokitansky syndrome, Mayer-Rokitansky-Küster-Hauser syndrome, MRKH syndrome). It presented as post-coital blood spotting for 3 months.

*Conclusion:* As a routine, all cases of vaginal construction regardless of the reason for the surgery or the lining of the neovagina should have a continuous annual examination and careful inspection of the entire vagina. Biopsy of any unusual finding should be done. Despite the dark color of the vaginal lesion, bleeding and rapid appearance our patient had a benign tumor. Radiation therapy to the neovagina and prolonged treatment with podophyllin and cauterization should be avoided.

---

**Key Words.** Split-thickness skin graft—Neovagina—Neoplasm—Rokitansky syndrome—MRKH syndrome

---

## Introduction

The majority of the few cases reported of neoplasms of the neovagina were malignant or in-situ carcinoma. The purpose of this paper is to report a rare case of a benign tumor arising in the neovagina.

Our patient had Rokitansky syndrome, which occurs at about 8 weeks of embryogenesis when the fetus fails to fuse the lower müllerian ducts to form the uterus and upper vagina. Other structures which

form at that time may also have defects with about 25% of those with the syndrome having an absent or abnormal kidney and about 16% with abnormal vertebrae. The ovaries and the karyotype are normal. The etiology is unknown. The general growth and development of the patient are normal.<sup>1</sup>

There are many procedures which have been used to create a vagina for congenital absence or after surgical removal for malignancy.<sup>2</sup> These include vaginal dilators by external pressure (Frank method), pulling in the vaginal dimple from an abdominal approach (Vecchietti method) and creating an external pouch (Williams method). The traditional approach has been dissection of a space and lining it with an isolated segment of small or large bowel, peritoneum, dura, amnion, or other tissues. In the United States most procedures have been done with a modified McIndoe procedure<sup>3</sup> in which a space is dissected and lined with a split-thickness skin graft from the patient to avoid rejection.<sup>4</sup>

Good results had been reported with the McIndoe procedure but without long term observation.<sup>5</sup>

## Case Report

The patient was 29 years old with very fair skin, 5 feet 9 inches tall and weighing 135 pounds. She had Rokitansky syndrome and a right pelvic kidney. A McIndoe procedure with a split thickness skin graft from the buttock was performed 12 years previously. The histologic structure of a sample of donor skin was normal at the McIndoe procedure. There was an excellent take of the entire graft. Routine examination one year earlier revealed a normal entire skin graft.

The patient reported post-coital vaginal staining for 3 months. On the lateral right middle vagina was a dark, brown-black, smooth, round, 3-mm wide,

---

Address correspondence to: Albert Altchek, MD, 1 E. 89<sup>th</sup> Street, New York, NY 10128; E-mail: [albertaltchek@aol.com](mailto:albertaltchek@aol.com)

raised lesion. PCR tests for chlamydia and gonorrhea, bacterial cultures, and mycoplasma and ureaplasma cultures were all negative. Cytology was negative for intraepithelial malignancy but did show multiple plaques of anucleated squamous cells. An excisional biopsy was done which showed a polypoid lesion characterized by a central fibrovascular core lined by stratified squamous mucosa (Fig. 1). No dysplastic or human papilloma virus associated changes were noticed. Seborrheic keratosis-like changes, characterized by hyperkeratosis and multiple intraepithelial keratotic whorls, were noticed (Fig. 2). The fibrovascular core had variable amount of fibrous stroma and multiple thick walled vessels. Evidence of previous bleeding episodes was suggested by multiple dermal macrophages containing hemosiderin pigment (Fig. 3). In addition, melanin pigment was noticed in the basal layer of the squamous epithelium and in stroma (Fig. 4). The adjacent vaginal wall looked like normal keratinized skin.

Considering the benign nature of this neoplasm and lacking evidence of viral changes, a diagnosis of squamous papilloma was rendered. (Figs. 1–4). The excision site healed uneventfully.

## Literature Review

In 1977, Garcia and Jones presented their experience in 64 patients with congenital absence of vagina in which a neovagina was created by the McIndoe technique and using a split-thickness skin graft. They reported three cases of condyloma acuminata in their series; however, no detailed account is available.<sup>5</sup> In 1977, Abrenio et al reported a 45-year-old patient treated with radiation with verrucous carcinoma who died with complications.<sup>6</sup>



**Fig. 1.** Squamous papilloma lined by mature squamous epithelium and central fibrovascular core. No dysplasia or viral cytopathic changes are present (H&E, 50X).



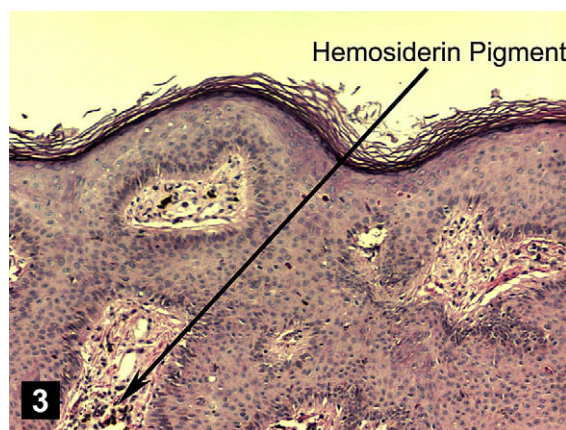
**Fig. 2.** Mature hyperkeratotic squamous epithelium with keratin whorls. These changes are similar to seborrheic keratosis-like changes seen in skin. (H&E, 200X).

Buscema et al reported condyloma accuminata in a neovagina with HPV6 identified by DNA hybridization.<sup>7</sup>

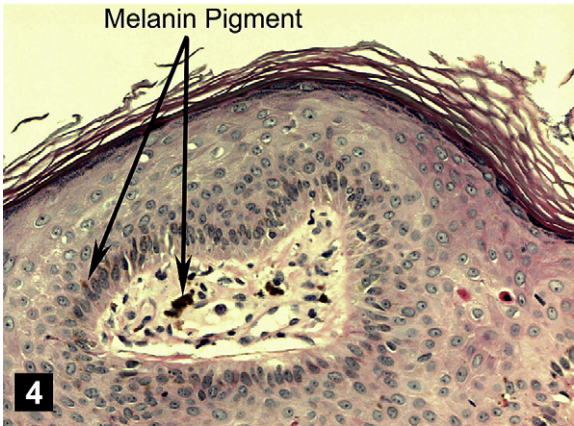
Two additional cases of large condylomata linked to HPV6 infection in the neovagina were described by Haney.<sup>8</sup>

Liguori et al reported condylomata acuminata of the neovagina created by using penile and scrotal skin flap in an HIV positive transsexual patient after male to female reassignment. HPV16, 31, and 33 were identified by DNA hybridization.<sup>9</sup>

In all eight cases of benign lesions have been reported in a neovagina (separate from our case) (cases 2–6, and 3 cases of Garcia (5)); see Table 1. All of these cases presented as exophytic growths resembling a neoplasm in contrast to flat warts usually seen in cervical or vaginal epithelium. This suggests a human papilloma virus effect.



**Fig. 3.** Surface epithelium of the squamous papilloma showing gradual maturing of cells without dysplastic or condylomatous changes. Hemosiderin laden macrophages are seen in the dermis (H&E, 100X).



**Fig. 4.** Squamous epithelium displaying hyperpigmentation in the basal layer of the epidermis as well as in the fibrovascular stroma. (H&E, 400X).

The first two cases of carcinoma in-situ were published by Lathorpe et al in 1985.<sup>10</sup>

In 1986 Imrie et al reported a case of carcinoma in-situ. Histologically, the lesions were diagnosed as high grade dysplasias and condylomas in the grafted skin; however, DNA hybridization did not reveal any HPV particles in the lesion on initial follow-up. Long term follow-up was not available.<sup>11</sup>

Since then there have been four additional reports of neovaginal carcinoma in-situ. Three had a neovagina for primary carcinoma in-situ and the fourth for congenital absence of uterus and vagina (Table 2).<sup>12–15</sup>

In all of the seven cases of vaginal carcinoma-in-situ (CIS) four had primary CIS (cases 1, 4, 5, 7). In all the cases autologous split-thickness, intermediate, and free skin grafts were used for the neovagina. In case 1 vaginal CIS developed after 6 years of topical podophyllin therapy for vulvar condylomata. Vaginectomy was done. CIS recurred in the skin graft. In case 2, three years after cervical squamous cell carcinoma treated by radiation, CIS was found in the vaginal apex. It was treated by total vaginectomy and split-thickness skin graft. CIS recurred in the neovagina.

Carcinoma of the neovagina is rare. The first case of a carcinoma of neovagina was reported by Richie et al in 1929.<sup>16</sup>

In 1938 a colonic graft was used for reconstruction which later developed into an adenocarcinoma.<sup>17</sup>

In 1959, Jackson created a neovagina for congenital absence of the vagina carcinoma without using any graft, pushing in the vaginal dimple to cause its vaginal squamous epithelial cells to grow inward and line the cavity. The tumor was treated with radiotherapy but recurred within three months.<sup>18</sup>

Barclay, in 1968, reported the first case of squamous cell carcinoma (originally called epidermoid tumor) in a patient with neovagina grafted at age 21 and

**Table 1.** Benign lesions of the neovagina\*

No.	Author/year published/ref	Primary condition/pathology	Procedure/graft	Neovaginal lesion	Follow-up
1	Abrenio et al, 1977 <sup>6</sup>	Congenital absence of vagina and uterus	Split thickness skin graft	Squamous papilloma/condyloma	Follow-up after treatment of recurrent condyloma using external radiation twice. Verrucous carcinoma developed 9 years later of the vagina and rectum and died of post-operative complications after resection.
2	Buscema et al, 1987 <sup>7</sup>	Congenital absence of vagina	McIndoe Procedure, Split thickness skin graft	Condylomata acuminata	Surgical excision followed by podophyllin treatment. Cryotherapy and complete surgical excision.
3	Haney et al, 1990 <sup>8</sup>	Vaginal agenesis	McIndoe procedure, split thickness skin graft	Condylomata acuminata	Surgical excision and trichloroacetic acid (TCA)
4	Haney et al, 1990 <sup>8</sup>	Vaginal agenesis	McIndoe procedure, split thickness skin graft	Condylomata acuminata	Resection and electroevaporation
5	Liguori et al, 2004 <sup>9</sup>	Male to female transsexual	Split skin graft	Condylomata acuminata	Surgical excision of lesion.
6	Present case	Rokitansky syndrome	McIndoe/split skin graft	Squamous papilloma	

\*Garcia and Jones<sup>5</sup> reported the first three cases of vaginal condyloma acuminata; however, a detailed account is not available.

**Table 2.** Carcinoma in-situ (CIS) arising in the neovagina

No.	Author/year published	Primary condition/pathology	Procedure/graft	Age at reconstruction	Neovaginal lesion	Treatment/Follow-up
1	Lathrop et al, 1985 <sup>10</sup>	CIS of cervix, vagina, vulva, perineum, clitoris after 6 years of podophyllin for vulvar condylomata	Vaginal hysterectomy, vaginectomy, radical vulvectomy Intermediate thickness skin graft from thigh.	36	Carcinoma in situ	Treatment/follow-up C.I.S. reappeared in neovagina 18 months after surgery. Local excision NED* after 8 years.
2	Lathrop et al, 1985 <sup>10</sup>	Cervix squamous cell cancer discovered by TAH, BSO <sup>j</sup> treated by radiation. 3 years later vaginal apex had CIS.	Total vaginectomy, split thickness skin graft from thigh for later CIS.	46	Recurrent CIS	Intravaginal 5-fluorouracil.
3	Imrie et al, 1986 <sup>11</sup>	Congenital absence of vagina	McIndoe procedure, free skin graft	29	Carcinoma in situ	Total vaginectomy
4	Wheelock et al, 1 <sup>st</sup> case, 1986 <sup>12</sup>	CIS of cervix and vagina	Free skin graft	69	Carcinoma in situ	Total vaginectomy
5	Gallup et al, 1987 <sup>13</sup>	CIS of cervix and vagina	Free skin graft	53	Carcinoma in situ	Excision and intravaginal 5-fluorouracil
6	Lowe et al, 2001 <sup>14</sup>	Congenital absence of uterus and vagina	McIndoe procedure, free skin graft	49	Carcinoma in situ	Laser ablation followed by total vaginectomy
7	Güven et al, 2005 <sup>15</sup>	Carcinoma in situ of cervix, vagina, vulva, perineum.	Vaginal hysterectomy, vaginectomy, skinning vulvectomy, free skin graft.	33	Carcinoma in situ	Partial vaginectomy, free skin graft

\*NED, no evidence of disease.

<sup>j</sup>TAH, total abdominal hysterectomy; BSO, bilateral salpingo-oophorectomy; CIS, carcinoma in-situ.

at age 26 was found to have an advanced “epidermoid cancer” of the upper vagina with a solitary pelvic kidney resting on the top of the tumor mass which was fixed to the right pelvic wall. Her first operation was at 18 with a dissection of a space in the McIndoe procedure but without skin graft, which had an unsatisfactory result.<sup>19</sup>

Ramming et al. described a case of squamous cell carcinoma in a neovagina. He emphasized that the tumor arose from the transplanted skin and not from the previously excised vaginal lining or cervix carcinoma.<sup>20</sup>

In 1972 squamous cell carcinoma was reported in a patient with congenital absence of vagina.<sup>21</sup> Since then another 22 cases of neovaginal carcinomas have been reported (Table 3). In 2002 Steiner et al described a 29-year-old patient who had a neovagina and later had radiation and surgery for vaginal granulation tissue and 9 years later biopsy showed squamous cell carcinoma.<sup>38</sup>

Of the 28 cases of malignant neoplasms arising in the neovagina (Table 3), 18 had a neovagina constructed for vaginal agenesis (Rokitansky Syndrome) and two had testicular feminization. In one case, a vagina was created for male to female reassignment and later developed carcinoma. In seven cases the neovagina was made after surgical treatment for genital malignancy.

Squamous cell carcinoma developed in 18 patients including one in the neovagina who developed verrucous carcinoma. Twelve of the patients had preceding skin grafts (Table 3).

Squamous cell carcinoma also developed in one case of penile and scrotal skin, dura, peritoneum, and rectus abdominal myocutaneous flap. One case with pelvic and thigh skin flaps developed malignant melanoma. In one case there was no graft and in one there was no information about the graft (Table 3).

Of 28 cases who developed malignant neoplasms in the neovagina, three of the neovaginas had been made with ileum and four with colon and these seven developed adenocarcinoma. Two patients who received a split-thickness skin graft developed adenocarcinomas (cases 10, 19), being hypothesized to arise from skin adnexal glandular epithelium.

Primary vaginal endometrioid type adenocarcinoma was reported in a patient with Rokitansky syndrome without reconstruction. The origin from residual müllerian tissue was proposed.<sup>42</sup>

It was postulated that different types of malignant neoplasm may arise from the native vaginal tissue or müllerian remnants as well as from the grafted skin.

An analysis was made of possible predisposing factors for later tumor formation after split-thickness skin graft was used to create a neovagina. In all the eight cases of benign neovaginal neoplasia the lesion

**Table 3.** Malignant neoplasms arising in the neovagina

No.	Author/year published	Primary condition/ pathology	Procedure/graft	Age at reconstruction	Neovaginal pathology	Age at diagnosis	Follow-up
1	Ritchie, 1929 <sup>16</sup>	Congenital absence of vagina	Baldwin reconstruction. Ileal graft	13	Adenocarcinoma	26	Died after six month
2	Lavand-Homme, 1938 <sup>17</sup>	Congenital absence of vagina	Schubert procedure, Colonic graft	18	Adenocarcioma	33	NFA*
3	Jackson, 1959 <sup>18</sup>	Congenital absence of vagina	Wharton's procedure <sup>†</sup> , McIndoe, Repeat Wharton	17	Squamous cell carcinoma	25	Recurrence at three months
4	Barclay, 1968 <sup>19</sup>	Congenital absence of vagina	McIndoe, split thickness skin graft.	21	Squamous cell carcinoma	26	Died of progressive disease
5	Ramming, 1970 <sup>20</sup>	Cervical squamous cell carcinoma	McIndoe, split thickness graft	36	Squamous cell carcinoma	39	NED <sup>‡</sup> after 4 years of submucosal resection of posterior vagina
6	Duckler, 1972 <sup>21</sup>	testicular Feminization syndrome	McIndoe, split thickness skin graft from thigh	17	Squamous cell carcinoma	36	Free of disease for 1.5 years after posterior exenteration
7	Steffanoff, 1973 <sup>22</sup>	Testicular feminization syndrome	Inlay split thickness skin graft	17	Squamous cell carcinoma	36	NFA
8	Abrenio et al, 1977 <sup>6</sup> (same case in Table 1)	Congenital absence of vagina and uterus	Split thickness skin graft from thigh	45	Verrucous carcinoma with focal anaplastic changes	71	Abdominoperineal resection and excision of artificial vagina and rectum. Died of post- operative complications
9	Rotmensch et al, 1983 <sup>23</sup>	Congential absence of vagina	McIndoe, free skin graft	18	Squamous cell carcinoma	33	Total pelvic exenterations. NED
10	Jaeger and Engel, 1984 <sup>24</sup>	Congenital absence of vagina	Split skin graft	NA	Adenocarcioma	42	NA
11	Andryjowicz et al, 1985 <sup>25</sup>	Vaginal Squamous cell carcinoma	Ileal graft	39	Adenocarcinoma	42	Excision of neovagina. NED.
12	Rummel et al, 1985 <sup>26</sup>	Congenital absence of vagina	Split skin graft	17	Squamous cell carcinoma	30	NA
13	Wheelock et al 1987 <sup>12</sup> 2 <sup>nd</sup> case,	Carcinoma insitu of vulva vagina and cervix	Split skin graft	55	Squamous cell carcinoma	58	Anterior exenterations. NED after 7 years.
14	Hopkins MP, 1987 <sup>27</sup>	Congenital absence of vagina	McIndoe, Split skin graft	17	Squamous cell carcinoma	42	Recurrence after 3 years. Died of uremia
15	Baltzer and Zander, 1989 <sup>28</sup>	Congenital absence of vagina	Modified McIndoe	28	Squamous cell carcinoma	43	Surgical excision of tumor followed by radiation. NED after 11 months.

(Continued)

Table 3 (Continued)

No.	Author/year published	Primary condition/ pathology	Procedure/graft	Age at reconstruction	Neovaginal pathology	Age at diagnosis	Follow-up
16	Borruto and Ferraro, 1990 <sup>29</sup>	Vaginal agenesis	Baldwin technique, ileal graft	21	Adenocarcinoma	60	Complete neovaginal excision. No further follow-up.
17	Balik et al, 1992 <sup>30</sup>	Congenital absence of vagina	Peritoneal graft	19	Squamous cell carcinoma	38	Radiotherapy, NFD
18	Ursic-Vrscaj et al, 1994 <sup>31</sup>	Squamous cell carcinoma of the cervix.	Wertheim Meigs, Sigmoid colon	36	Adenocarcinoma	58	Neovaginal excision, NED after 2.5 years.
19	Munkarah et al, 1994 <sup>32</sup>	Vaginal agenesis	Split skin graft	24	Adenocarcinoma	42	Radical resection of neovagina.
20	Carlson et al, 1995 <sup>33</sup>	Squamous cell carcinoma of cervix	Rectus abdominus myocutaneous flap	64	Squamous cell carcinoma	65	Radiotherapy, distant metastasis several months later.
21	Lara et al, 1997 <sup>34</sup>	Squamous cell carcinoma of the cervix	Pelvic and thigh skin flaps	55	Malignant melanoma	71	Excision biopsy of lesion. NED of disease after 7 months
22	Bobin et al, 1999 <sup>35</sup>	Congenital absence of vagina.	Cleavage technique without skin graft.	22	Squamous cell carcinoma	43	Recurrence after 6 months, treated by chemotherapy.
23	Schult et al, 2000 <sup>36</sup>	Vaginal and uterine aplasia	NA	16	Squamous cell carcinoma	32	Pelvic exenterations and radiotherapy. NED after 4 months.
24	Hiroi et al, 2001 <sup>37</sup>	Congenital absence of vagina	Ruge; Sigmoid colon	30	Adenocarcinoma	53	Total excision of neovagina followed by radiotherapy, NED after 18 months.
25	Steiner et al, 2002 <sup>38</sup>	Congenital absence of vagina	Warthon/Dura	17	Squamous cell carcinoma	29	Total exenterations, recurrence at 4 month treated by local excision and radiotherapy. NED after 1 year
26	Harder et al, 2002 <sup>39</sup>	Male to female reassignment	Penile and scrotal skin inversion.	24	Squamous cell carcinoma.	44	Total resection of neovagina followed by chemo and radiotherapy. NED after 2.5 years.
27	Schouten van der Velden et al, 2005 <sup>40</sup>	Pelvic exenterations for sarcoma botryoides	Sigmoid colon	28	Adenocarcinoma	45	Total excision of neovagina. Perineal tumor recurrence at 6 months. Liver metastasis, palliative chemotherapy.
28	Liebrich et al, 2006 <sup>41</sup>	Congenital agenesis of vagina	Vecchietti Method, Skin graft	20	Squamous cell carcinoma	48	Complete excision of the tumor

\*NFA, no follow-up available.

†vaginal reconstruction with epithelialization.

‡NED, no evidence of disease.

was condylomata acuminata and the presumed etiology was human papilloma virus (Table 1). All 7 cases of CIS had skin grafts. One case had 6 years of podophyllin treatment (case 1). One had radiation for cervical squamous cell carcinoma 3 years previously (case 2). Three (cases 4, 5, 7) had primary CIS and following vaginectomy neovagina had CIS. Two cases (cases 3, 6) had no apparent predisposing factors (Table 2).

Of 28 cases of malignant neovaginal neoplasia 12 had skin grafts. Of the 12 there were no apparent predisposing factors (cases 3, 5, 9, 10, 11, 12, 14, 15, 19). Two cases had testicular feminization (cases 6, 7) however this was probably coincidental. One case had radiation treatment (case 8). One case had previous CIS of the cervix, vulva and vagina (case 13) (Table 3).

Thus the possible predisposing suspects for neoplasia in skin graft neovagina in this series are chronic podophyllin treatment, CIS, radiation treatment, and human papilloma virus.

The neovaginas constructed with intestine did not form benign neoplasia or CIS. All seven developed adenocarcinoma. None developed squamous cell carcinoma. Three of them had a malignancy treated by vaginectomy before the neovagina construction (case 11 had vaginal squamous cell carcinoma; case 18 had cervical squamous cell carcinoma; case 27 had vaginal sarcoma botryoides).

A larger series would be required to determine whether this was coincidental, whether intestinal grafts have an inherent predisposition to malignancy, or whether there is an unknown factor predisposing to vaginal malignancy.

Since the total number of surgical neovaginas is unknown as well as those using skin grafts or intestinal grafts the relative risk of each developing malignant neoplasia is unknown.

Neovaginal cytology after total pelvic exenteration for gynecological malignancies showed anucleated squamous cells. There were superficial and intermediate squamous cells with a shift to the right in maturation index indicating a higher percentage of superficial cells over a period of 4 months to 6 years of follow-up.<sup>43</sup>

A series of 90 cases of vaginal agenesis who had the McIndoe procedure demonstrated maturing squamous cells on cytology.<sup>44</sup>

Another group has documented the cytological changes in neovagina created by Vecchiotti's technique and found same histology as of normal vaginal mucosa.<sup>45</sup> The Vecchiotti procedure is pulling in the vaginal dimple which results in the formation of normal vaginal squamous mucosa.

The histologic examination of our patient's lesions did not indicate an association with human papilloma virus. She never had vulvar condyloma accuminatum.

Despite the history of postcoital bleeding and dark color of the tumor, it was benign. We recommend removal of the entire lesion; expert pathology review of permanent slides is essential, before any further treatment.

Our patient had an active sex life and was planning surrogate motherhood.

Perhaps transplanting skin from a normal cool dry surface to inside the vaginal cavity with a moist warm environment might affect its biological behavior.

The lesion developed in less than one year, possibly during the three preceding months of bleeding.

It is very improbable that the lesion was missed at the previous examination. There is a standard annual routine complete visualization of the entire neovagina.

Routine annual complete examination of the entire neovagina should be done indefinitely. More frequent examinations are not practical. If there is bleeding or other symptoms the patient should be seen promptly.

Since there have been only a relatively few cases reported of tumors of the neovagina, their late appearance, and the unknown total number and type of neovaginas, it is not possible to know predisposing factors to tumor formation. The benign tumors could be overlooked if routine examinations are not done.

Possible predisposing factors to tumor formation might include radiation therapy; chronic local inflammation due to podophyllin, cauterization and infection; association with human papilloma virus; vaginal and cervical malignancy; and the use of ileum or colon to line the neovagina. Most neovaginas in the USA are done with split-thickness skin grafts.<sup>4</sup>

At cytologic examination anucleated squamous cells are found in all neovaginas if there is a complete take of the split-thickness skin graft. If there is an incomplete take of the graft and the raw area gets covered over by ingrowing vaginal squamous epithelial cells from the introitus vaginal dimple, cytology shows normal vaginal cells.<sup>4</sup>

The differential diagnosis of exophytic lesions includes squamous papillomatosis, also called squamous papillomas. They usually develop in clusters around the hymenal ring in the vestibule. The histology is a single papillary frond with a central fibrovascular core without the complex arborizing architecture and koilocytes of the condyloma, and not associated with human papilloma virus infection.<sup>46</sup>

## References

1. Griffin JE, Edwards C, Madden JD, et al: Congenital absence of the vagina. The Mayer-Rokitansky-Küster-Hauser syndrome. *Ann Intern Med* 1976; 85:224
2. Altchek A: Congenital absence of the uterus and vagina. In: Altchek A, Deligdisch L, editors. *The Uterus, Pathology, Diagnosis and Management*. New York, Springer-Verlag, 1991, pp 272–293

3. McIndoe AH, Bannister JB: An operation for the cure of congenital absence of the vagina. *J Obstet Gynecol Brit Empire* 1938; 45:490
4. Altchek A: Rokitansky syndrome. In: *Pediatric, Adolescent, and Young Adult Gynecology*. Edited by A Altchek, L Deligdisch. Oxford, Wiley-Blackwell, 2009, pp 215-230.
5. Garcia J, Jones HW Jr: The split thickness graft technique for vaginal agenesis. *Obstet Gynecol* 1977; 49:328
6. Abrenio JK, Chung HI, Pomante R: Verrucous carcinoma arising from an artificial vagina. *Obstet Gynecol* 1977; 50:18s
7. Buscema J, Rosenshein NB, Shah K: Condylomata acuminata arising in a neovagina. *Obstet Gynecol* 1987; 69:528
8. Haney AF: Vaginal condylomata acuminata after McIndoe neovagina creation. *Sex Transm Dis* 1990; 17:102
9. Liguori G, Trombetta C, Bucci S, et al: Condylomata acuminata of the neovagina in a HIV-seropositive male-to-female transsexual. *Urol Int* 2004; 73:87
10. Lathrop JC, Ree HJ, McDuff HC Jr: Intraepithelial neoplasia of the neovagina. *Obstet Gynecol* 1985; 65:91S
11. Imrie JE, Kennedy JH, Holmes JD, et al: Intraepithelial neoplasia arising in an artificial vagina. *Br J Obstet Gynaecol* 1986; 93:886
12. Wheelock JB, Schneider V, Goplerud DR: Malignancy arising in the transplanted vagina. *South Med J* 1986; 79: 1585
13. Gallup DG, Castle CA, Stock RJ: Recurrent carcinoma in situ of the vagina following split-thickness skin graft vaginoplasty. *Gynecol Oncol* 1987; 26:98
14. Lowe MP, Ault KA, Sood AK: Recurrent carcinoma in situ of a neovagina. *Gynecol Oncol* 2001; 80:403
15. Guven S, Guvendag Guven ES, Ayhan A, et al: Recurrence of high-grade squamous intraepithelial neoplasia in neovagina: case report and review of the literature. *Int J Gynecol Cancer* 2005; 15:1179
16. Ritchie N: Primary carcinoma of the vagina following Baldwin reconstruction operation for congenital absence of the vagina. *Am J Obstet Gynecol* 1929; 18:794
17. Lavand-Homme P: Complication tardive apparue au niveau d'un vagin artificiel. [Late carcinoma of the artificial vagina formed from the rectum]. *Brux Med* 1938; 19:14
18. Jackson GW: Primary carcinoma of an artificial vagina. Report of a case. *Obstet Gynecol* 1959; 14:534
19. Cali R, Pratt JH: Congenital absence of the vagina. Long-term results of vaginal reconstruction in 175 cases. [Barclay DL, Discussion]. *Am J Obstet Gynecol* 1968; 100:761.
20. Ramming KP, Pilch YH, Powell RD Jr, et al: Primary carcinoma in an artificial vagina. *Am J Surg* 1970; 120:108
21. Duckler L: Squamous cell carcinoma developing in an artificial vagina. *Obstet Gynecol* 1972; 40:35
22. Steffanoff DN: Late development of squamous cell carcinoma in a split-skin graft lining a vagina. *Plast Reconstr Surg* 1973; 51:454
23. Rotmensch J, Rosenshein N, Dillon M, et al: Carcinoma arising in the neovagina: case report and review of the literature. *Obstet Gynecol* 1983; 61:534
24. Jaeger K, Engel C: Karzinom in künstlicher Scheide bei kongenitaler Vaginal-Aplasie. *Der Krankenhausarzt* 1984; 57:49
25. Andryjowicz E, Qizilbash AH, DePetrillo AD, et al: Adenocarcinoma in a cecal neovagina—complication of irradiation: report of a case and review of literature. *Gynecol Oncol* 1985; 21:235
26. Rummel HH, Kühn W, Heberling D: Carcinoma formation in a neovagina following vaginoplasty. *Geburtshilfe Frauenheilkd* 1985; 45:124
27. Hopkins MP, Morley GW: Squamous cell carcinoma of the neovagina. *Obstet Gynecol* 1987; 69:525
28. Baltzer J, Zander J: Primary squamous cell carcinoma of the neovagina. *Gynecol Oncol* 1989; 35:99
29. Borruto F, Ferraro F: Adenocarcinoma of a neovagina constructed according to the Baldwin-Mori technique. *Eur J Gynaecol Oncol* 1990; 11:403
30. Balik E, Maral I, Sözen U, et al: Carcinoma arising in Davydov neovagina. *Geburtsh Frauenheilk* 1992; 52:68
31. Ursic-Vrscaj M, Lindtner J, Lamovec J, et al: Adenocarcinoma in a sigmoid neovagina 22 years after Wertheim-Meigs operation. Case report. *Eur J Gynaecol Oncol* 1994; 15:24
32. Munkarah A, Malone JM, Budey HD, et al: Mucinous adenocarcinoma arising in a neovagina. *Gynecol Oncol* 1994; 52:272
33. Carlson JW, Saltzman AK, Carter JR, et al: Recurrent squamous cell carcinoma in a rectus abdominis neovagina. *Gynecol Oncol* 1995; 59:159
34. Lara PN, Hearn E, Leigh B: Neovaginal malignant melanoma following surgery and radiation for vulvar squamous cell carcinoma. *Gynecol Oncol* 1997; 65:520
35. Bobin JY, Zinzindohoue C, Naba T, et al: Primary squamous cell carcinoma in a patient with vaginal agenesis. *Gynecol Oncol* 1999; 74:293
36. Schult M, Hecker A, Lelle RJ, et al: Recurrent rectovaginal fistula caused by an incidental squamous cell carcinoma of the neovagina in Mayer-Rokitansky-Kuster-Häuser syndrome. *Gynecol Oncol* 2000; 77:210
37. Hiroi H, Yasugi T, Matsumoto K, et al: Mucinous adenocarcinoma arising in a neovagina using the sigmoid colon thirty years after operation: a case report. *J Surg Oncol* 2001; 77:61
38. Steiner E, Woernle F, Kuhn W, et al: Carcinoma of the neovagina: case report and review of the literature. *Gynecol Oncol* 2002; 84:171
39. Harder Y, Erni D, Banic A: Squamous cell carcinoma of the penile skin in a neovagina 20 years after male-to-female reassignment. *Br J Plast Surg* 2002; 55:449
40. Schouten van der Velden AP, de Hingh IH, Schijf CP, et al: Metachronous colorectal malignancies: "don't forget the neo vagina". A case report. *Gynecol Oncol* 2005; 97:279
41. Liebrich C, Reinecke-Luthge A, Kuhnle H, et al: Squamous cell carcinoma in neovagina at Mayer-Rokitansky-Küster-Hauser-syndrome. *Zentralbl Gynakol* 2006; 128:271
42. Tewari DS, McHale MT, Kuo JV, et al: Primary invasive vaginal cancer in the setting of the Mayer-Rokitansky-Küster-Hauser syndrome. *Gynecol Oncol* 2002; 85:384
43. Selvaggi SM, Haefner HK, Lelle RJ, et al: Neovaginal cytology after total pelvic exenteration for gynecological malignancies. *Diagn Cytopathol* 1995; 13:22
44. Salvatore CA, Lodovici O: Vaginal agenesis: an analysis of ninety cases. *Acta Obstet Gynecol Scand* 1978; 57:89
45. Belleanne G, Brun JL, Trouette H, et al: Cytologic findings in a neovagina created with Vecchietti's technique for treating vaginal aplasia. *Acta Cytol* 1998; 42:945
46. Kurman RJ: *Blaustein's Pathology of the Female Genital Tract*, (5th ed.). London, Springer Verlag, 2002. pp 173.